made arrangements for the repetition in the south and centre of England of the Northumberland "manuring for mutton" experiment. This work, started in the spring of 1897, took the form of determining the results of the manurial treatment of grass land, not in terms of hay, but in the terms of live-weight increase. Ten three-acre plots were fenced off on a large field of poor pasture, and nine of these plots were subjected to as many distinct forms of treatment. The plots have each year been grazed by sheep, each plot being stocked with as many animals as a committee of practical farmers considered it would carry. The individual weights of the animals are determined by monthly weighings. During the first season (1897) variations in the yield of animal increase were fairly pronounced; while in the second, third and fourth years the results have been extremely striking. Lime, used alone, has almost failed to act; while phosphates, especially basic slag, have, in some cases, enabled the land to carry twice as many sheep as the untreated area, and not only so, but the animals have given more than double the individual live-weight increase. The addition of sulphate of ammonia or potash to a phosphatic dressing has had extremely little influence, whereas the beneficial effects of a similar addition of pulverised lime have been very conspicuous. The yield of hay on separate sub-plots gave but a modified reflection of the mutton results, showing that the manures have had much more influence on the quality than on the quantity of the herbage. By a single expenditure of about twenty shillings per acre on manure, it has been shown that land worth five shillings per acre per annum has been—temporarily at least—raised in value to five or six times this sum. Whether such a result will be obtained in other parts of the country it would be hazardous to predict, but there can be no question of the desirability of putting the matter to the test, and it is satisfactory to find that the Board has made arrangements to do so.

The past ten years may be regarded as a period of adjustment in the history of the provincial agricultural colleges. They were called into being as a result of the sudden endowment of county councils with large funds, and practically no preparations had been made for their reception. They were placed in the receipt of grants from public bodies, and these bodies naturally wanted results for their money. If these results could be made to loom large in the eyes of the county council electorate, so much the better. The success of a local lecture was judged rather by the size of the audience than by any educational standard. The county councils vied with each other as to the number of field demonstrations they could show. But things are different now. Both colleges and county councils have elaborated educational schemes, and work will in the future be tested by its intrinsic quality. Now that the feverish incentive to the production of results has been replaced by a demand for thoroughness, it is to be hoped that the colleges will be allowed to settle down to do some first-class work. But, with the best intentions, county councils sometimes handicap the staff of the institutions that they support. It is quite impossible that a department of agriculture can develop in such a way as to do justice to its students, or to take its proper place amongst the other departments of a college or University if a large portion of the time of the members of its staff has to be spent away from headquarters. The local work that they are doing may be of the greatest importance, but the time occupied in its preparation and accomplishment makes a serious inroad on the efficiency of in-college work. It is to be hoped that county councils will give their support to central institutions without being too exacting in their local demands upon them, while the Board of Agriculture should be endowed with funds sufficient to enable the agricultural departments of the colleges to prosecute the highest forms of research. WM. SOMERVILLE.

HORTICULTURAL PRACTICE.

ONE method by which the gardener "improves" particular plants was well illustrated at the Hybridisation Conference held in the gardens of the Royal Horticultural Society last year. The proceedings of that meeting were amply recorded in these columns at the time, so that there is no need to do more than mention that branch of the subject. Another method of improvement consists in the continuous selection of the best and the cotemporaneous elimination of inferior varieties. This is the method followed by the great seed-firms, who devote large areas to their trial grounds and take the greatest pains to secure and maintain the purity of their stocks. A variation may arise from seed or from "sports," the latter term being applied to bud-variations which occur suddenly, no one knows why. If the variation be a desirable one, the cultivator preserves the seed, sows it, and in due time finds that a certain percentage of the seedlings reproduces the desired form. Further sowings take place, the percentage of the new variation being constantly increased till at length the seeds are said "to come true," and a new species, at any rate so far as gardens are concerned, is evolved by the constant practice of selection.

In the case of a sport, propagation is effected by cuttings or grafts.

The advent of the Chrysanthemum season reminds us of other practices which the gardener adopts with the view of securing "improvement." Those who visited the recent exhibitions at the Royal Horticultural Society and at the Westminster Aquarium must have been forcibly struck with the contrast between the wild Chinese Chrysanthemum and the Japanese varieties, which constituted the essential part of the exhibition. The wild plant, sent from the Royal Gardens, Kew, was discovered in central China. Horticulturally it was but a poor weed, with small yellow flower-heads about half an inch in diameter, by no means so attractive as our own corn-marigold. Yet from this plant, either alone or when crossed with another species, the Chinese and the Japanese have evolved flowers of every shade of colour except blue, and the gardener has produced flowers 15 and 18 inches in diameter.

The Japanese varieties, originally introduced by Fortune in 1862, at once attracted attention by their large size and fantastic form. It is these Japanese varieties that now constitute the staple of our exhibitions, and their size and colour offer, as we have said, the greatest possible contrast to the inconspicuous flowers of the wild plant. They are purely artificial productions, and nothing like them occurs in nature, although occasionally, in Composites, malformations occur in the ray-florets which give a clue to the origin of these strange productions.

It is mainly to the art of the gardener that we owe these monstrous blooms. That art consists essentially in "disbudding" or in removing certain buds and leaving others. As the history is interesting and not generally known in scientific circles, it may be well briefly to summarise the facts of the case. The "first break" or lateral bud of a Chrysanthemum makes its appearance from the middle of April to the middle of June, the precise period differing in the case of different varieties. The second or "crown" bud appears in August, and consists of a flower-bud surrounded by leafy shoots, which grow sympodially; these are removed, and the development of the central flower-bud allowed to proceed. The third or "terminal" bud is formed in September, and always consists of one central bud surrounded by other secondary flower-buds, but not by any leaf-shoots. The secondary flower-buds are removed, and all the energy of the plant concentrated in the central bud, which, in florists' language, is "taken," or, more correctly, which is reserved.

Lastly, in December, after the flowers are over, a quantity of leaf-buds are produced from the base of the stem. These are used as cuttings.

Dis-budding is a common enough procedure in roses and other flowers grown for exhibition; but the peculiarity in the Chrysanthemum is the difference in the position, time of formation, and nature of the buds. The practice varies in accordance with these differences. Different varieties demand different treatment. In some instances the bud must be "taken" at this time, in other cases at a different period. In some varieties the best blooms are produced by the "crown" buds; in others it is the terminal buds that produce the finest flowers. All this is determined by experiment, but in any case this variation in the position, form and time of development of the buds is sufficiently important to attract the attention of the physiologist.

Another practice now much followed is that of retarding the growing and flowering period of plants by means of cold. By this means flowers, say of lily of the valley, can be had at any season that may be desired.

The chief point of physiological interest appears to reside in the fact that plants can be subjected without injury to much lower degrees of cold than was formerly supposed.

SOME REMARKABLE EARTHQUAKE EFFECTS.

MR. R. D. OLDHAM'S elaborate report on the great earthquake of June 12, 1897, published in the *Memoirs* of the Geological Survey of India (vol. xxix.), has been referred to on several occasions in these columns; and an abstract has been given of its most important contents (vol. lxii. p. 305, July 26, 1900). There are many striking illustrations of earthquake effects in the report, and three of the plates are here reproduced.

That pillars and other similar objects may be left standing, but with one part twisted round upon another, has long been known as a fantastic effect of severe earthquakes, and even in some cases of earthquakes which can scarcely be called severe. There is, however, no instance where cases of this kind were so numerous, and so various in the nature of the object rotated, as the Indian earthquake. The most imposing and striking of the many instances of twisting found by Mr. Oldham is that of the monument to George Inglis, erected in 1850 at Chhatak. This conspicuous landmark takes the form of an obelisk, and, rising from a base 12 feet square, must have been over 60 feet high before the earthquake. It is built of broad, flat bricks, or tiles, laid in mortar and plastered over, and is represented in its present state in Fig. 1. About 6 feet of the monument was broken off and fell to the south, and 9 feet to the east. Of the remainder, the top 20 feet was separated at a height of about 23 feet from the ground, and twisted in the opposite direction to that of the hands of a watch lying face upwards on the ground.

The view in Fig. 2 shows some tombs in the cemetery at Cherrapunji. All the tombs are of the oblong form with sloping tops, and are built of rubble stone masonry. Few are broken up, but nearly all have sunk down into the loose sand beneath them, and are leaning over at various angles to the north. The cemetery is situated on the top of one of the small knolls of sandstone which are scattered over the Cherra plateau. This sandstone originally rested upon the limestone of the plateau, which has been dissolved away from beneath it, and is accordingly much broken. The earthquake seems to have shaken the surface down into a perfect quicksand, into which the tombs sank.

A direct measure of the amplitude of the earth-wave, or of the greatest movement of the wave particle backward and forward, was obtained at Cherrapunji. Mr. Oldham concludes, from observations of the length of a depression scooped out by the movement of the ground against some tombs which remained stationary, that the extreme range of motion cannot have been less than ten

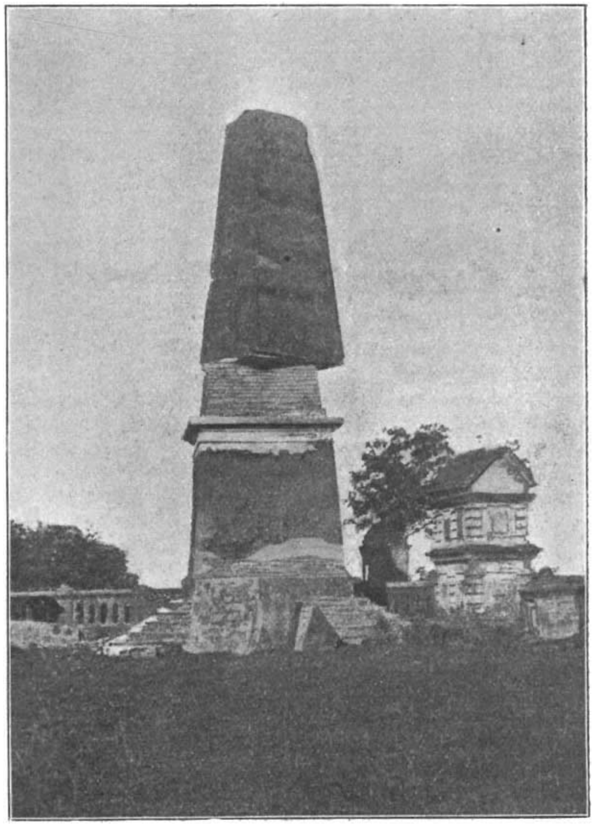

FIG 1.—Monument at Chhatak, with part twisted by earthquake. The part of the monument left standing is about 46 feet high.

inches, may have been as much as eighteen inches, and was probably about fourteen inches. The amplitude or range of the wave particle on either side of its original position would be half these amounts.

The banks of the Brahmaputra are fissured at intervals on each side along a length of 260 miles, and fissures

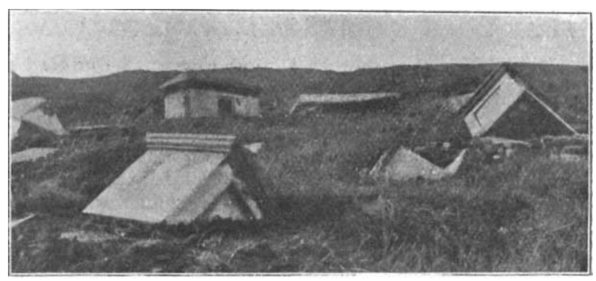

FIG. 2.—Tombs in cemetery, Cherrapunji.

extend along the banks of all the minor branches of the river and its tributaries within the disturbed area. As a rule, the fissures run parallel to the bank of the river, and where this is not the case, some peculiarity in the contour of the ground—a drop, for instance, from a higher to a lower level—can usually be found to account for the